

Appl. No. 10/541,258
Amtd. Dated May 25, 2010
Reply to Office Action of November 24, 2009

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AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A printing apparatus comprising:
 - a carrying means for carrying an object onto which liquid is to be projected;
 - a liquid spraying means having nozzles to spray the liquid as droplets onto the object having been carried to a position where the object faces the nozzles;
 - a liquid-spraying controlling means for controlling the liquid spraying means to spray the droplets from the nozzles at a predetermined timing;
 - an environment detecting means for detecting an ambient temperature and/or humidity when the droplets are sprayed from the nozzles;
 - a carrying-speed discriminating means for judging whether the carrying speed of the object has been changed; and
 - a storage means having stored therein liquid-spraying control data intended for controlling the liquid-spraying timing the liquid-spraying controlling means controlling the liquid-spraying means when the carrying-speed discriminating means has determined that the object carrying speed has been changed to alter currently used liquid-spraying control data on the basis of the environment data detected by the environment detecting means to spray the droplets from the nozzles at a different timing from that which is before the carrying speed is changed and further wherein the liquid-spraying control data is adjusted based on carrying-speed change information and environment data in order to reduce color mis-registration in printed image data.

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2. (Previously Presented) The printing apparatus according to claim 1, wherein:

the liquid spraying means has a plurality of the nozzles disposed side by side in the object-carrying direction to spray the droplets toward the object first from the upstream nozzle in the object-carrying direction and finally from the downstream one in this order in the object-carrying direction.

3. (Previously Presented) The printing apparatus according to claim 1, wherein

the carrying means includes a feed roller that rotates about its own axis and a delivery roller located downstream in the object carrying direction in relation to the liquid spraying means which rotates about its own axis at a higher speed than the feed roller.

4. (Previously Presented) The printing apparatus according to claim 1, wherein the carrying-speed discriminating means includes a trailing-end sensor located upstream of the liquid-spraying means in the object-carrying direction to detect the trailing end of the object in the carrying direction and which determines that the carrying speed has been changed.

5. (Previously Presented) The printing apparatus according to claim 1, wherein the nozzles of the liquid-spraying means are disposed side by side generally in line in a direction generally perpendicular to the object-carrying direction.

6. (Currently Amended) A printing method comprising:

carrying an object onto which liquid is to be projected in a predetermined direction via a carrying mechanism;

spraying liquid as droplets onto the object by a liquid spraying mechanism having nozzles;

controlling the liquid spraying means to spray the droplets from the nozzles in predetermined timing with a liquid spraying controlling mechanism;

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detecting an ambient temperature and/or humidity when the droplets are sprayed from the nozzles with an environment detecting mechanism;

judging whether the carrying speed of the object has been changed with a carrying speed detecting mechanism; and

storing liquid-spraying control data intended for controlling the liquid-spraying timing, spraying droplets from the nozzles at a different timing when the carrying speed detecting mechanism determines that the carrying speed has changed based on the environment data detected by the environment detecting mechanism and further wherein the liquid-spraying control data is adjusted based on carrying-speed change information and environment data in order to reduce color mis-registration in printed image data.

7. (Previously Presented) The printing method according to claim 6, wherein:

a plurality of the nozzles are disposed side by side in the object-carrying direction to spray the droplets toward the object first from an upstream nozzle in the object-carrying direction and finally from a downstream one in this order in the object-carrying direction.

8. (Previously Presented) The printing method according to claim 7, wherein the carrying mechanism includes a feed roller located upstream of the liquid-spraying means in the object carrying direction that rotates about its own axis, and a delivery roller located downstream of the liquid-spraying means in the object carrying direction that rotates about its own axis at a higher speed than the feed roller.

9. (Previously Presented) The printing method according to claim 6, wherein the carrying speed detecting mechanism includes a trailing-end sensor located upstream of the liquid-spraying means in the object-carrying direction which detects the trailing end of the object in the carrying

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direction and which determines that the carrying speed has been changed.

10. (Previously Presented) The printing method according to claim 6, wherein the nozzles are disposed side by side generally in line in a direction generally perpendicular to the object-carrying direction.

11. (Currently Amended) A printing comprising:

a carrying means for carrying an object onto which liquid is to be projected in a predetermined direction;

a liquid spraying means having nozzles to spray the liquid as droplets onto the object having been carried to a position where the object faces the nozzles;

a liquid-spraying controlling means for controlling the liquid spraying means to spray the droplets from the nozzles at a predetermined timing;

an environment detecting means for detecting an ambient temperature and/or humidity when the droplets are sprayed from the nozzles;

a carrying-speed discriminating means for judging whether the carrying speed of the object has been changed;

a droplet-projected position detecting means for detecting a displacement of a droplet-projected position which arises when the droplets are projected in a predetermined pattern on the object being carried because the object carrying speed has been changed;

a data generating means for generating liquid-spraying control data intended for controlling the liquid-spraying timing to correct the displacement of droplet-projected position detected by the liquid-projected position detecting means; and

a storage means for storing the liquid-spraying control data generated by the data

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generating means,

the liquid-spraying controlling means controlling the liquid-spraying means when the carrying-speed discriminating means has determined that the object carrying speed has been changed on the basis of the environment data detected by the environment detecting means and liquid-spraying control data, stored in the storage means, to spray the droplets from the nozzles at a different timing from that which is before the carrying speed is changed and further wherein the liquid-spraying control data is adjusted based on carrying-speed change information and environment data in order to reduce color mis-registration in printed image data.

12. (Previously Presented) The printing apparatus according to claim 11, wherein

the liquid spraying means has a plurality of the nozzles disposed side by side in the object-carrying direction to spray the droplets toward the object first from the upstream nozzle in the object-carrying direction and finally from the downstream one in this order in the object-carrying direction.

13. (Previously Presented) The printing apparatus according to claim 11, wherein:

the carrying means includes a feed roller that rotates about its own axis and a delivery roller located downstream in the object carrying direction in relation to the liquid spraying means which rotates about its own axis at a higher speed than the feed roller.

14. (Previously Presented) The printing apparatus according to claim 11, wherein the carrying-speed discriminating means includes a trailing-end sensor provided upstream in the object-carrying direction in relation to the liquid-spraying means to detect the trailing end of the object in the carrying direction and which determines that the carrying speed has been changed.

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15. (Previously Presented) The printing apparatus according to claim 11, wherein the storage means has pre-stored therein the liquid-spraying control data.

16. (Previously Presented) The printing apparatus according to claim 11, wherein the nozzles of the liquid-spraying means are disposed side by side generally in line in a direction generally perpendicular to the object-carrying direction.

17. (Currently Amended) A printing method for comprising:

carrying an object onto which liquid is to be projected in a predetermined direction with a carrying mechanism;

spraying the liquid as droplets onto the object having been carried to a position where the object faces the nozzles with a liquid spraying mechanism;

controlling the liquid spraying mechanism to spray the droplets from the nozzles at a predetermined timing;

detecting an ambient temperature and/or humidity when the droplets are sprayed from the nozzles with an environment detecting apparatus;

judging whether the carrying speed of the object has been changed with a carrying speed discriminating mechanism;

detecting a displacement of droplet-projected position, which arises when the object carrying speed has been changed with a droplet projected position detecting mechanism;

generating liquid-spraying control data intended for controlling the liquid-spraying timing to correct the displacement of droplet-projected position detected by the liquid-projected position detecting mechanism; and

storing the liquid-spraying control data whereby when the carrying-speed discriminating

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mechanism has determined that the object carrying speed has been changed, the liquid-spraying controlling mechanism controls the liquid-spraying mechanism on the basis of the environment data detected by the environment detecting mechanism and liquid-spraying control data to spray the droplets from the nozzles at a different timing from that which is before the carrying speed is changed and further wherein the liquid-spraying control data is adjusted based on carrying-speed change information and environment data in order to reduce color mis-registration in printed image data.

18. (Previously Presented) The printing method according to claim 17, wherein:
a plurality of the nozzles are disposed side by side in the object-carrying direction to spray the droplets toward the object first from the upstream nozzle in the object-carrying direction and finally from the downstream one in this order in the object-carrying direction.
19. (Previously Presented) The printing method according to claim 17, wherein as the carrying mechanism, there are provided a feed roller located upstream of the liquid-spraying means in the object carrying direction, and a delivery roller located downstream of the liquid-spraying means in the object carrying direction which rotates about its own axis at a higher speed than the feed roller.
20. (Previously Presented) The printing method according to claim 17, wherein the carrying-speed discriminating mechanism includes a trailing-end sensor located upstream of the liquid-spraying means in the object-carrying direction to detect the trailing end of the object in the carrying direction and which determines that the carrying speed has been changed.
21. (Previously Presented) The printing method according to claim 17, wherein the liquid-

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spraying control data is pre-stored.

22. (Previously Presented) The printing method according to claim 17, wherein the nozzles are disposed side by side generally in line in a direction generally perpendicular to the object-carrying direction.